# CITY OF VERNONIA
# PUBLIC WORKS
# DESIGN STANDARDS

## 3.0000 - STORM DRAINAGE

### 3.0010 - GENERAL DESIGN REQUIREMENTS

Performance Standards - Storm drainage design within a development area must include provisions to adequately control runoff from all public and private streets and the roof, footing, and area drains of residential, multi-family, commercial, or industrial buildings. The design must ensure future extension of the drainage system to the entire drainage basin in conformance with these Design Standards. These provisions include:

a. Surface or subsurface drainage, caused or affected by the changing of the natural grade of the existing ground or removal of natural ground cover or placement of impervious surfaces, shall not be allowed to flow over adjacent public or private property in a volume or location materially different from that which existed before development occurred, but shall be collected and conveyed in an approved manner to an approved point of disposal.

b. Surface water entering the subject property shall be received at the naturally occurring locations and surface water exiting the subject property shall be discharged at the natural locations with adequate energy dissipaters within the subject property to minimize downstream damage and with no diversion at any of these points.

c. The approved point of disposal for all storm water may be a storm drain, dry wells, existing open channel, creek, detention, or retention pond approved by the Superintendent of Public Works. Acceptance of suggested systems will depend upon the prevailing site conditions, capacity of existing downstream facilities, and feasibility of the alternate design.

d. When private property must be crossed in order to reach an approved point of disposal, it shall be the developer's responsibility to acquire a recorded drainage easement (of dimensions in accordance with those included in Section 3.0024). The drainage facility installed must be a closed conduit system. Temporary drainage ditch facilities, when approved, must be engineered to contain the storm water without causing erosion or other adverse effects to the private property.

e. The design peak discharge from the subject property may not be increased from conditions existing prior to the proposed development except where it can be satisfactorily demonstrated by the applicant that there is no adverse impact.

f. Retention/detention facilities will be required where necessary to maintain surface water discharge rates at or below the existing design storm peak discharge except where it can be demonstrated by the applicant that no adverse impart will result from not providing said facilities.

g. Minimum width of an access easement from an existing public road to a drainage facility shall be fifteen (15) feet.

h. Drainage from roofs, footings, and downspouts may drain directly to a street through the curb under the following circumstances:

   1. The building pad ground elevation is at least two (2) feet above the existing street curb, and

   2. The existing street is adequately crowned to avoid sheet flow across the street. This requirement will be waived if curb and gutter is existing or installed.

i. Vegetation shall be established on areas disturbed by/or on areas of construction as necessary to minimize erosion, in accordance with Section 3.0050 of these standards.

All storm drain system designs shall make adequate provisions for collecting all storm water runoff. The system shall accommodate all runoff from upstream tributary areas whether or not such areas are within the proposed development. The amount of runoff to be accommodated shall be based upon ultimate development of all upstream tributary areas.

Where storm drains are constructed on slopes greater than 20%, in areas designated as hazardous or where there are site conditions that may cause damage to improvements, slippage or slides or determined by the Superintendent of Public Works, a soils and/or geologic report may be required.

For erosion control requirements refer to Section 2.0130.

Where the finished graded surface has a greater than 20% slope, or as required, soil stabilization fabric shall be placed over the entire disturbed area.

Proposed storm drain systems shall not discharge flows into inadequate downstream systems unless approved by the Superintendent of Public Works.

Public storm lines shall be located within the public right-of-way as directed by the Superintendent of Public Works, per Section 3.0021. These lines are placed in the public right-of-way for ease of maintenance access, control of the facility, operation of the facility, and to provide required replacement and/or repair.

***Standard drawings relevant to this section may be found in the most current specifications and edition of the APWA Standard Specifications for Public Works Construction, Oregon Chapter.***

3.0011 - SITE DRAINAGE PLANS

Existing Drainage Plan - Provide a topographical contour map defining existing conditions to include the following minimum information:

a. Two-foot (2') contour intervals, slopes over 10% may use 5-foot (5') intervals extend Contours a minimum of 100 feet beyond property.

b. All structures, buildings, parking lots and utilities on the property.

c. Isolation of all existing drainage facilities and water courses, including wetlands and flood plain areas.

Locations of all subsurface water outlets (e.g., - springs.) Show arrows to indicate direction of flow for all drainage information.

Proposed Drainage Plan - Show proposed site grading and drainage facilities on a topographical contour map. Unless the detail for proposed improvements will obscure the conditions shown on the existing drainage plan, proposed site grading and drainage may be shown on the existing drainage plan. The following minimum information shall also be shown.

a. Finished contours of the property after development shall be at two-foot (2') contour intervals, slopes over 10% may use 5-foot (5') intervals, extend contours a minimum of 100 feet beyond property.

b. Percent grade, for graded slopes, elevations, dimensions and locations for all graded slopes.

c. Cut/fill areas' structural fill placement areas erosion/sedimentation control methods reseeding areas.

d. All proposed drainage facilities - public and private systems; drainage ditches, culverts.

Drainage Calculations - Furnish such supporting information as required per Section: 1.0140 of these Design Standards.

Detention Requirements - All proposed development will be required to use adequate drainage management practices. Developments located within a master planned drainage basin will follow the recommendations adopted to that plan. Developments not located within master planned drainage basins will minimize the rate and amount of runoff to receiving systems and streams.

## 3.0012 - PIPE MATERIALS AND SIZE

Public storm drains may be constructed of the following materials: Concrete, Ductile Iron, PVC, HDPE.

When pipe has less than minimum cover as defined in Section 3.0023 the pipe material shall be ductile iron.

Public and private storm drain pipe shall meet the appropriate sections of the Uniform Plumbing Code.

All public storm drain lateral lines to catch basins and other inlet structures shall be a minimum of ten inches (10") in diameter. All public storm drain main lines shall be a minimum of twelve inches (12") in diameter.

## 3.0013 - MINIMUM DESIGN CRITERIA

Storm Frequency - All public storm drain systems shall be designed for the design storm recurrence interval in the following table:

DRAINAGE SYSTEM DESIGN CAPACITY

| Drainage System Element | Design Storm Recurrence Interval Years |
|---|---|
| Minor: | 10 |
| Streets, curbs, gutters, inlets catch basin and connector drains | |
| Major: | |
| Laterals (collectors) < 250 tributary acres | 10 |
| Trunk > 250 tributary acres | 50* |
| Arterial Streets and the Drainage System in or under Arterial Streets | 50* |
| Watercourses: without designated floodplain | 50 |
| with designated floodplain | 100 |
| Bridges | 100 |
| Detention Facilities: | 25 |
| Storage volume (on site) | 100 |
| Storage volume | Function of downstream capacity |
| Discharge rate | |

* SURCHARGING contained within pipe system will be allowed.

Time of Concentration - Overland flow of runoff to the initial catchment point into the storm drain system shall be a minimum of ten (10) minutes.

Velocity and Slope - All storm drains shall be on a grade which produces a mean velocity, when flowing full, of at least three feet (3') per second.

Manning Equations - When calculating minimum pipe slopes and velocities, the design engineer shall use the Manning pipe friction formula.

Pipe Coefficient - The storm drain pipe roughness coefficient to be used in the Manning formula shall be not less than 0.013.

Storm Water Flows - Several alternative methods are available to design engineers for estimating peak runoff. For areas under 240 acres, the "Rational" formula can be used. Regression equations can only be used as a check on the other methods. For areas over 240 acres, a Hydrographic based formula shall be used.

## 3.0020 - ALIGNMENT AND COVER

### 3.0021 - RIGHT-OF-WAY LOCATION

Storm drain lines shall generally be located five (5) feet (south or east) from right-of-way to centerline. All changes in direction of pipe shall be made at an approved structure, except as provided in Section: 3.0022.

### 3.0022 - CURVATURE

Storm drain lines shall not be curved between structures. If unusual circumstances are present, as determined by the Superintendent of Public Works, small diameter storm drains may be curved. Such curves shall conform to the street curvature.

### 3.0023 - MINIMUM COVER

All storm drains shall be laid at a depth sufficient to protect against damage by traffic and to drain building footings where practical. Sufficient depth shall mean the minimum cover from the top of the pipe to finish grade at the storm drain alignment.

Minimum cover shall be thirty inches (30") above the top of the pipe in paved areas and thirty-six inches (36") at all other locations. Less than minimum cover shall be allowed only, if unusual circumstances are present, as determined by the Superintendent of Public Works.

The design engineer must show that sufficient depth is provided at the boundary of the development to properly drain the remainder of the upstream basin area tributary to the site.

### 3.0024 - EASEMENTS

a. When it is necessary to locate storm drains in easements, the storm drain shall be centered in the easement. All storm drain easements shall be exclusive and shall not be used for any purpose which would interfere with the unrestricted use of the storm drain line. Exceptions to this requirement will be reviewed on a case by case basis, (e.g., a utility corridor in a new subdivision).

b. Easements for storm drain lines thirty-six inches (36") or less in diameter shall have a minimum width of fifteen feet (15'). All pipe lines greater than thirty-six inches (36 ) in diameter, shall have a minimum width of twenty feet (20'). Larger widths may be required for special circumstances, such as excessively deep pipe or location of building to the easement.

c. Open channels shall have easements sufficient in width to cover the 100-year Floodplain Line when a 100-year design storm is required or fifteen feet (15') from the waterway centerline or ten feet (10') from the top of the recognized bank, whichever is greater. A

fifteen-foot (15') wide access easement shall be provided on both sides of the channel for channel widths greater than fourteen feet (14') at the top of the recognized bank.

d. Easement locations for public storm drains serving a PUD, apartment complex, or commercial/industrial development shall be in parking lots, private drives, or similar open areas which will permit unobstructed vehicle access for maintenance.

e. Structures cannot be built over the easements, and trees and large bushes cannot be planted in the easement.

f. All easements must be furnished to the City for review and approval prior to recording.

3.0025 - RELATION TO WATERCOURSES

Storm drain lines shall enter a creek or drainage channel at $90^0$ or Less to the direction of flow. The outlet shall have a head wall and scour pad or rip rap to prevent erosion of the existing bank or channel bottom. The size of pipe or channel being entered will govern which protective measures are required. All protective measures must conform to the requirements of Section 3.0050 of these Design Standards.

3.0030 - STRUCTURE LOCATION

3.0031 - MANHOLES

Manholes shall be located at all changes in slope, alignment, pipe size, and at all pipe junctions with present or future storm drains. Manhole spacing shall not be greater than 400 feet.

Standard manholes are required when rim to crown of pipe elevations exceed four feet (4') at pipe junctions. Flat-top manholes shall be used when rim to crown of pipe elevations are less than four feet (4').

When the downstream pipe size increases, the crown of all upstream pipes shall not be lower than the crown of the larger downstream pipe.

3.0032 - CATCH BASINS

Catch basins shall be located in streets at the curb line to receive storm water runoff and convey it to the main storm drain.

Catch basins shall be located at the following locations but in no case be spaced further than 300 feet:

a. At curb returns on the upstream side of an intersection.

b. At the ends of all dead-end streets with a descending grade.

c. At intermediate locations so that storm flows at the curb line do not exceed three feet (3') in width (measured from the curb face) or three inches (3 ) in depth (measured at the curb face,) whichever is less.

d. At all low points.

e. On street grades grater than 10 % the maximum spacing shall be 150 feet.

f. On street grades less than 1% the maximum spacing shall be 150 feet.

Catch basins shall be capable of intercepting, completely, the design storm flows at the curb.

## 3.0033 - DRY WELLS

Where there are no natural or constructed drain ways, or an existing storm water system, dry wells can be used as a discharge point with the approval of the Superintendent of Public Works.

Dry well systems shall be constructed with two manholes. The collector pipes shall discharge into the first manhole, which shall be constructed as an oil-water separator and settling basin. Liquid will then flow to the second manhole, which shall be a perforated manhole. The second manhole shall extend down to river rock or to the natural water table.

## 3.0034 - ANCHOR BLOCKS

For storm drain pipes greater than four (4) inches in diameter, concrete anchor blocks shall be required if the slopes are greater than twenty (20) percent. Anchor blocks shall key into trench sides. Spacing for anchor blocks is as follows:

SPACING FOR ANCHOR BLOCK FOR ALL SIZE PIPE

| SLOPE % | MINIMUM SPACING (FT) |
|---|---|
| 0 - 19.99 | NO ANCHOR REQUIRED |
| 20 - 34.99 | 35 |
| 35 - 50.99 | 25 |
| 51 - OR MORE | 15 OR SPECIAL DESIGN |

## 3.0035 - WATER BARS

Where the finished graded surface has a slope greater than or equal to 3 units horizontal to 1 unit vertical or as required, water bars shall be installed. The water bars shall be sloped slightly to drain runoff water away from the pipe line alignment. Water bars shall have a maximum spacing of forty (40) feet.

## 3.0040 - STORM DETENTION

## 3.0041 - DEVELOPMENT NOT REQUIRING DETENTION

In general, developments meeting the following criteria will not be required to provide detention:

a. Land divisions of less than four lots.

b. Multi-family developments of less than four units.

c. Commercial and industrial development where the construction of a new facility or expansion of an existing facility will not increase the impervious area by more than 5,000 square feet.

## 3.0042 - FLOODPLAIN INFORMATION

Floodplain information, delineating the 100-year floodplain limits, shall be shown where it occurs within the development. Floodplain limits shall be based on maps prepared by the UPS. Army Corps of Engineers and the Federal Emergency Management Agency (F.E.M.A.) Where better information is available, it shall be used by the Design Engineer.

## 3.0043 - DETENTION VOLUME

When detention is required, the volume to be detained shall be based on the following:

The rate of runoff from a developed site during a 25-year recurrence interval storm shall not exceed the pre-development rate of runoff released based on a 10-year recurrence interval storm.

## 3.0044 - EMERGENCY OVERFLOW

The Design Engineer shall assess the impacts of system failure for on-site detention. Overflows may occur due to rainfall intensity which exceeds the design storm, debris blockage of storm drain system, or some other reason.

If a system overflows, it shall not cause inundation of neighboring properties. Potential overflow routes shall be protected from erosion by adequate means.

## 3.0045 - DETENTION FACILITIES

Detention volume storage methods in order of preference are the following:

a. Surface storage

b. Underground storage

## 3.0050 - EROSION CONTROL

Developments shall provide erosion control methods to limit the removal of soil materials by storm runoff during the construction phases of a project.

## 3.0051 - EROSION CONTROL - APPLICATION

1. For subdivision plats temporary erosion control measures also shall be utilized by the applicant during installation of plat improvements and by subsequent builders during construction of dwellings and other lot improvements.

2. Prior to the initial clearing and grading of any land development, provisions shall be made for the interception of all potential silt-laden runoff that could result from said clearing and grading. Said interception shall preclude any silt-laden runoff from discharging from the proposed land development to downstream properties unless previously approved by the Superintendent of Public Works. Said interception shall cause all silt-laden runoff to be conveyed by open ditch or other means to whatever temporary facility is necessary to remove silt prior to discharge to downstream properties.

3. Prior to initial clearing and grading of construction site, an evaluation of the following factors must be carried out:

a. Soil Erodibility - Soil credibility should be identified using Soil Conservation Service credibility ratings. Erosion control techniques shall be designed accordingly.

b. Slope and Runoff - Cleared areas will require protection from erosion.

c. Cover - Erosion protection will be required for all disturbed areas.

Temporary facilities may include silt fences, drain barriers, gravel entries, ditches, surface stabilization or other devices as necessary.

Temporary/permanent hydro-seeding or acceptable seeding and mulching must be provided whenever perennial cover cannot be established on sites which will be exposed after September 1 or prior to June 1.

## 3.0060 - PRIVATE DRAINAGE SYSTEMS

## 3.0061 - SUBDIVISIONS

When subdivision lots drain to the rear, it may be necessary to provide a private drainage system in private easements. This system shall be for collection of roof drains, footing drains and surface runoff. This system shall be designed to meet the Uniform Plumbing Code requirements.

## 3.0062 - SUBSURFACE DRAINAGE

Subsurface drains (under drains) shall be provided at the following locations:

a. For all existing springs and field tile intercepted during construction activity for other facilities, i.e. sewer, water, mains, street excavations, foundations, etc. Subsurface drains are not needed if the tile is removed.

b. Where high ground water exists or when it is necessary to reduce the piezometric surface to an acceptable level to prevent land slippage or under floor flooding of buildings.

c. The drainage line installed shall begin at a clean-out and terminate at an approved point of disposal. Open jointed storm drain lines will not be considered as an acceptable solution.